DOCUMENT RESUME

ED 154 987 SE 024 063

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TITLE Employment Survey 1976. AIP Report.
INSTITUTION American Inst. of Physics, New York, N.Y. Education and Manpower Div.
REPORT NO AIP-R-282
PUB DATE Dec 77
NOTE 7p.
AVAILABLE FROM American Inst. of Physics, 335 East 45 St., New York, N.Y. 10017 (no price quoted)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Astronomy; *Employment; Employment Level; Employment Trends; *Job Market; Job Placement; *Physics; *Science Careers; Science Education; *Surveys

ABSTRACT

This document presents the summary results of the 1976 employment survey of physics and astronomy graduates of the class of 1975-76 as conducted by the American Institute of Physics (AIP). Data presented include employment status 6-18 months after graduation; background characteristics of doctoral, master's and bachelor's level physicists; time spent seeking employment; work activity and type of dissertation; and, employment relationship to physics. (SL)

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ED154987

# EMPLOYMENT SURVEY 1976

by Susanne D. Ellis

AIP Pub. No. R-282 December 1977

Results from the Employment Survey are being published as a separate report for the first time this year; previously portions of the results were included in the Survey of Physics Bachelor's Degree Recipients and the Graduate Student Survey.

Since the early 1960's physics graduates at the three degree levels–bachelor's, master's, doctor's–were asked, by means of summer surveys, to describe their employment opportunities. However, for many graduates the summer is a time when either they have not had an opportunity to explore the job market properly, or their job offers have not yet materialized into actual positions. Thus, the need for a follow-up survey became apparent with the objective of examining the extent to which the employment plans of the previous summer's graduates had been converted into work activities with specific employers.

The 1976 Employment Survey was directed at graduates of the class of 1975–76 who were interested in employment, and was conducted during the following winter of 1976–77.

Responses were received from 1504 out of 1977 physics and 97 out of 117 astronomy graduates. The astronomy graduates were included for the first time in this follow-up Employment Survey.

Table I gives an overall employment picture of recent physics and astronomy graduates at the three degree levels for the winter of 1976–77. That winter represented periods after graduation ranging from 6 to 18 months, because degree recipients from July and August 1975 through June 1976 were included among the respondents. Thus, some of those who classify themselves as unemployed and currently seeking employment may have graduated in the summer of 1975, held temporary positions for a year, and were then seeking employment again at the time of this survey.

The nineteen bachelors shown as 'students' in Table I are graduates who were seeking employment during the previous summer, but changed their plans and started graduate school instead.

**TABLE I. Employment status of 1975–76 physics and astronomy degree recipients, 6–18 months after graduation.**

| Graduates 1975–76 | | Employment status: Postdoctoral fellowship | | Full-time employment | | Part-time employment | | Student | | Unemployed & seeking | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | N | % |
| Physics | Doctorate | 228 | 49% | 222 | 47% | 10 | 2% | – | | 9 | 2% | 469 | 100 |
| | Terminal master's degree | – | | 145 | 75 | 11 | 6 | 22 | 11% | 15 | 8 | 193 | 100 |
| | Bachelor's degree | – | | 708 | 84 | 51 | 6 | 19 | 2 | 64 | 8 | 842 | 100 |
| Total physics | | 228 | | 1075 | | 71 | | 41 | | 87 | | 1504 | |
| Astronomy | Doctorate | 29 | 48% | 22 | 37% | 3 | 5% | 1 | 2% | 5 | 8% | 60 | 100 |
| | Terminal master's degree | – | | 6 | | 2 | | 4 | | 2 | | 14 | |
| | Bachelor's degree | – | | 17 | | 4 | | 1 | | 1 | | 23 | |
| Total astronomy | | 29 | | 45 | | 9 | | 6 | | 8 | | 97 | |
| Total in survey | | 257 | | 1120 | | 80 | | 47 | | 95 | | 1601 | |



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**TABLE II. Background characteristics of doctoral physicists in the 1976 Employment Survey.**

| Characteristics | | Employment status: 'Postdocs' | Employment status: Full-time employed | Total |
|---|---|---|---|---|
| Sex | Female | 6% | 7% | 6% |
| | Male | 94 | 93 | 94 |
| Citizenship | U.S. | 77% | 82% | 79% |
| | Foreign | 23 | 18 | 21 |
| Age | 25 or younger | 3% | 1% | 3% |
| | 26–27 | 24 | 16 | 20 |
| | 28–29 | 38 | 30 | 33 |
| | 30–35 | 33 | 41 | 37 |
| | 36 or older | 2 | 12 | 7 |
| Selected subfields of dissertation | Astrophysics | 7% | 9% | 8% |
| | Atomic & molecular | 14 | 10 | 12 |
| | Elem. particles | 22 | 9 | 16 |
| | Nuclear | 12 | 10 | 10 |
| | Solid state | 26 | 30 | 28 |
| Number of respondents | | 228 | 222 | 450 |

The doctoral physicist respondents are almost equally divided between post-doctoral fellows and those holding full-time permanent positions; **Table II** examines several background characteristics of those two groups. While the percentage of women is almost the same for the two groups, the 'postdocs' include a higher proportion of foreign citizens than the group that is full-time employed. 'Postdocs' also tend to be younger and 22% of them as compared with 9% of the full-time employed group specialized in elementary particles when they were graduate students. Among the nine unemployed doctorate recipients shown in **Table I** but not included in **Table II** are two women and two foreign citizens. Examining the characteristics of sex and citizenship for the sixty doctoral astronomers, shown in **Table I**, we find four women and four foreign citizens among them.

In recent years an increasing proportion of the postdoctoral fellowships are granted for two years or longer; for example, this Employment Survey records 65% of the physics postdoctoral fellowships to be for that long a duration while in 1973 only 57% of them were for two or more years.

One can also relate the lengths of fellowships to whether or not they are offered to the institution's own graduates. This analysis shows that 80% of those who accepted physics 'postdocs', accepted them from an institution other than the one granting their PhD, and that a larger proportion of the fellowships at a different institution are for two or more years; namely 70% compared with 45% of those holding physics 'postdocs' at the same institution.

A frequent assumption has been the one that a postdoctoral fellowship is a graduate's second choice when he or she is unable to secure potentially permanent employment. This survey shows that almost 70% of those who accepted 'postdocs' in physics specifically sought those temporary positions, and 13% turned down offers with potential permanence to accept postdoctoral fellowships.

The proportions are somewhat different for doctoral astronomers who held 'postdocs' during the winter of 1976–77. **Figure I** shows that a smaller percentage of astronomers than physicists specifically sought 'postdocs' and 86% of the postdoctoral fellows, compared with 80% in physics, accepted their fellowships at different institutions from the ones that granted their astronomy doctorates.

In a comparison with other AIP surveys the Employment Survey requests information from a rather diverse group: doctors along with terminal masters and bachelors. For that reason two different questionnaires were designed for the Employment Survey. While several questions appear on both questionnaires, the one dealing with employment status varies on the two forms. Doctoral physicists, as mentioned earlier, were asked to complete a questionnaire that focused on the comparison between accepting a 'postdoc' or choosing a position that offers potential permanence. The bachelors and masters, on the other hand, were asked to compare their employment opportunities with the possibility of returning to graduate school. Since only 4% of the bachelors and 11% of the masters had changed from exploring the job market to resuming student status, one might conclude that the employment opportunities were fairly adequate for physics graduates without doctorates.

**Table III** also relates four background characteristics of physics bachelors and masters to their employment status during the winter 1976–77. But before drawing any conclusions from Table III, it is important to examine the right-hand column which gives the number of respondents to each question; some of the groups, such as women masters and foreign bachelors, are very small. By looking at the horizontal percentage distributions of **Table III** we find that the group who received bachelor's degrees at age 26 or older has the highest percentage of full-time employed members. Another conclusion one can draw from **Table III** is that more bachelor's degree recipients from the four-year colleges secured full-time employment than comparable graduates from PhD-granting institutions.

**Fig. I Postdoctoral fellowships for astronomy graduates, 1975–76.**

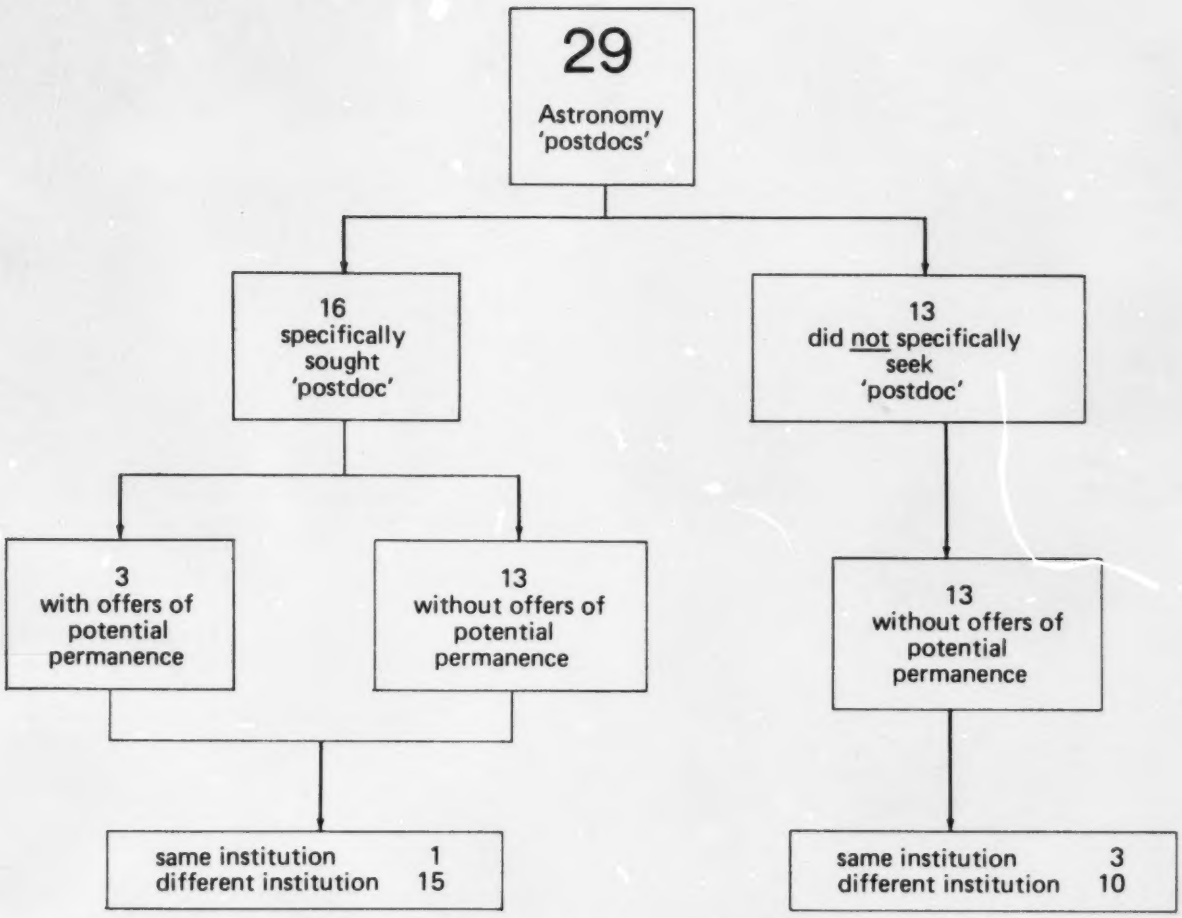


**TABLE II'. Background characteristics and employment status of newly-employed 1975–76 physics bachelors and masters.**

| Characteristics | Employment status, winter 1976–77 | | | | | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Employed | | | | Unemployed | | Student | | | | | |
| | Full-time | | Part-time, temp, etc. | | | | | | N | | % | |
| | BS/BA | MS/MA | BS/BA | MS/MA | BS/BA | MS/MA | BS/BA | MS/MA | BS/BA | MS/MA | BS/BA | MS/MA |
| Sex | | | | | | | | | | | | |
| Female | 76% | 55% | 14% | 20% | 6% | 15% | 4% | 10% | 115 | 20 | 14% | 11% |
| Male | 81 | 72 | 7 | 9 | 8 | 7 | 4 | 12 | 723 | 169 | 86 | 89 |
| | | | | | | | | | 838 | 189 | 100% | 100% |
| Citizenship | | | | | | | | | | | | |
| U.S. | 80% | 74% | 7 | 9% | 8% | 7% | 5% | 10% | 829 | 166 | 99% | 88% |
| Foreign | 88 | 59 | 12 | 5 | 0 | 14 | 0 | 22 | 8 | 22 | 1 | 12 |
| | | | | | | | | | 837 | 188 | 100% | 100% |
| Type of institution last attended | | | | | | | | | | | | |
| BS-granting | 82% | – | 7% | – | 7% | – | 4% | – | 350 | – | 42% | – |
| MS-granting | 84 | 72% | 6 | 13% | 6 | 8% | 4 | 7% | 147 | 72 | 17 | 37% |
| PhD-granting | 77 | 70 | 8 | 8 | 9 | 8 | 6 | 14 | 343 | 121 | 41 | 63 |
| | | | | | | | | | 840 | 193 | 100% | 100% |
| Age | | | | | | | | | | | | |
| 21 or younger | 81% | – | – | – | 16% | – | 3% | – | 31 | – | 4% | – |
| 22 | 77 | – | 9 | – | 8 | – | 6 | – | 390 | – | 47 | – |
| 23 | 81 | 75% | 9 | – | 6 | 12% | 4 | 13% | 191 | 8 | 23 | 4% |
| 24–25 | 79 | 71 | 8 | 10 | 10 | 7 | 3 | 12 | 88 | 83 | 11 | 43 |
| 26–29 | 88 | 63 | 6 | 14 | 3 | 10 | 3 | 13 | 68 | 62 | 8 | 33 |
| 30 or older | 95 | 87 | 2 | 3 | 3 | 5 | – | 5 | 62 | 38 | 7 | 20 |
| | | | | | | | | | 830 | 191 | 100% | 100% |
| Total % | 80% | 71% | 8% | 10% | 8% | 8% | 4% | 11% | 100% | 100% | | |

**Fig. II Time spent by 1975–76 men and women physics bachelors seeking employment.**

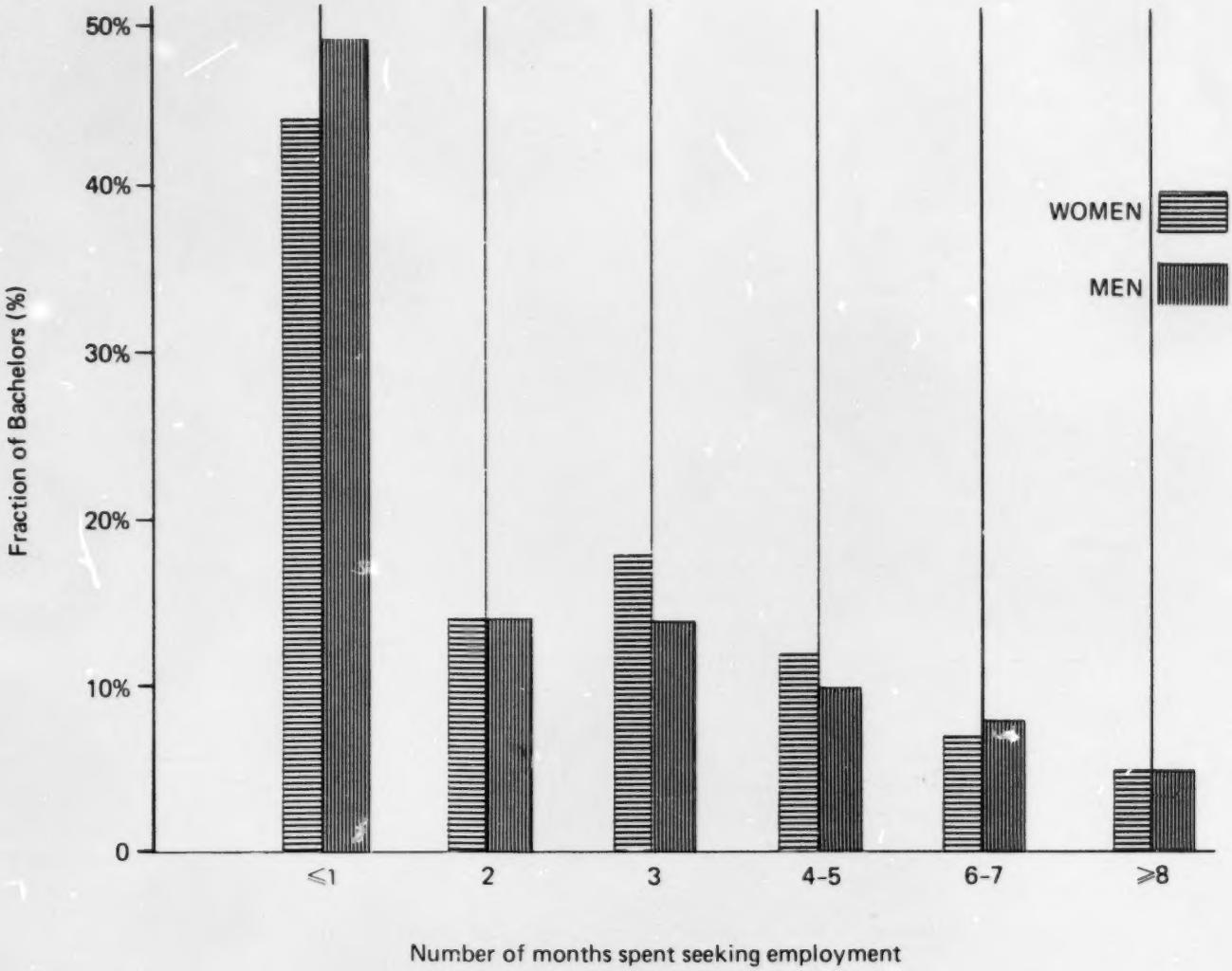


**Figure II** examines the question of how long it takes new physics bachelors to find full-time employment, and in particular: Do women graduates spend more time at that task than men? The bar graph is based on 641 respondents to this question, 95 of whom are women. Graduates who merely continued the employment they had as undergraduates, are not included in **Figure II**. Thus, to answer the above question one can say that a somewhat smaller proportion of the women graduates secured employment at or before graduation; 45% of the women and 49% of the men took one month or less time to accept initial employment. A similar bar graph for the terminal masters would not be meaningful because there were only eleven women graduates who sought employment. But comparing the male graduates with master's degrees with those shown in **Figure II**, only 24% of them secured employment within one month, while 49% of the bachelors did so. Thus one can conclude that greater differences in the time spent to seek employment exist between degree levels than between men and women graduates. Masters take longer to find initial employment than bachelors, but only a small fraction of the women graduates require more time than men to secure employment.

Another question, perhaps even more important than the one dealing with the time spent seeking employment, is how physics-related is the employment accepted by these graduates? Tables IV and V compare these characteristics and relate both time spent seeking employment and utilization of training to specific employers. Viewed as a group, 79% of the masters but only 55% of the bachelors described their

**TABLE IV. Employment of 1975–76 physics masters and the time spent seeking it.**

| | | Type of employer | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | High school | Jr/Sr coll. | University | Government | Military | Industry | Other incl. self-empl. | Total |
| | Physics-related | 97% | 100% | 100% | 80% | 63% | 75% | 60% | 79% |
| | Unrelated to physics | 3 | – | – | 20 | 37 | 25 | 40 | 21 |
| | Total—employed masters | 16 | 9 | 13 | 14 | 25 | 62 | 5 | 145 |
| | | 11% | 6% | 9% | 10% | 17% | 43% | 4% | 100% |
| Time spent seeking employment | Continue with same employer | 47% | 25% | – | 33% | 62% | 27% | 60% | 36% |
| | 1 month | 13 | – | 45% | 7 | 29 | 16 | – | 25 |
| | 2–3 months | 33 | 25 | 46 | 33 | 4 | 32 | 40 | 43 |
| | 4–5 months | 7 | 13 | – | – | – | 10 | – | 10 |
| | 6 months | – | 37 | 9 | 27 | 5 | 15 | – | 22 |
| | Total | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

**TABLE V. Employment of 1975–76 physics bachelors and the time spent seeking it.**

| | | Type of employer | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | High school | Jr/Sr coll. | University | Government | Military | Industry | Other | Total |
| | Physics-related | 79% | 86% | 62% | 67% | 56% | 53% | 18% | 55% |
| | Unrelated to physics | 21 | 14 | 38 | 33 | 44 | 47 | 82 | 45 |
| | Total—employed bachelors | 85 | 14 | 21 | 85 | 85 | 340 | 78 | 708 |
| | | 12% | 2% | 3% | 12% | 12% | 48% | 11% | 100% |
| Time spent seeking employment | Continue with same employer | 3% | 19% | 5% | 15% | 16% | 14% | 24% | 13% |
| | 1 month | 43 | 50 | 43 | 25 | 66 | 33 | 44 | 46 |
| | 2–3 months | 38 | 6 | 33 | 32 | 11 | 24 | 15 | 30 |
| | 4–5 months | 12 | 13 | 5 | 9 | 1 | 11 | 8 | 11 |
| | 6 months | 4 | 12 | 14 | 19 | 66 | 14 | 9 | 13 |
| | Total | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

employment as physics-related, and one reason for this difference could be the higher percentage of masters (36%) than bachelors (13%) who continue the employment they had as students. When such employment is physics-related, both the employer and the employee are interested in additional physics training for the employee, namely a master's degree.

When examining doctoral graduates, the extent to which their employers utilize their highly specialized training is of central concern. **Table VI** lists six types of employers and focuses on details of the utilization of the graduate's physics training. For example, where the physicist's work is physics-related, is it also in the same subfield as that of the dissertation, or in a different subfield? **Table VI** attempts to answer questions of this type by listing in its left-hand column five categories, the first two of which refer to physics-related employment, and the last three describe employment that is unrelated to physics. Thus we see that 78% of this group of full-time employed physicists is engaged in physics-related work. While one expects university employment to be closely related to the doctoral dissertation, **Table VI** shows that more than one quarter of the respondents employed in industry also hold positions which they describe as both physics-related and in the same subfield. Among those who list different branches of the government as their employers of physics-related work, more than half of them (57%) specified the Federally Funded Research Centers.

**TABLE VI. Full-time employment of 1975–76 doctoral-level physicists and its relationship to physics.**

| | | Type of employer | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | High school/Jr. coll. | 4 yr. Coll. | University | Government | Industry | Nonprofit org. | Total |
| Physics related & same subfield | | 17% | 45% | 64% | 26% | 27% | 20% | 35% |
| Physics related & diff. subfield | | 67 | 50 | 18 | 66 | 41 | – | 43 |
| Unrelated to physics but research oriented | | – | 5 | 5 | – | 8 | 20 | 5 |
| Unrelated to physics —new area | | – | – | 3 | 4 | 9 | 20 | 6 |
| Other unrelated employment | | 16 | – | 10 | 4 | 15 | 40 | 11 |
| Total | N | 11 | 24 | 47 | 53 | 80 | 7 | 222 |
| | % | 5% | 11% | 21% | 24% | 36% | 3% | 100% |

**Table VII. Full-time employment of 1975–76 doctoral-level physicists by work activity and type of dissertation.**

| | | Type of employer | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | High school/Jr. coll. | 4 yr. Coll. | University | Government | Industry | Nonprofit org. | Total |
| Total | N | 11 | 24 | 47 | 53 | 80 | 7 | 222 |
| | % | 5% | 11% | 21% | 24% | 36% | 3% | 100% |
| Type of dissertation | | | | | | | | |
| Experimental | | 5% | 14% | 18% | 23% | 38% | 2% | 100% 43% |
| Theoretical | | 6 | 10 | 19 | 27 | 35 | 3 | 100 31 |
| First work activity | | | | | | | | |
| Teaching | | 100% | 100% | 58% | 4% | – | – | 25% |
| Research | | – | – | 26 | 64 | 29% | 20% | 33 |
| Res. & dev. | | – | – | 3 | 12 | 24 | -- | 13 |
| Dev./Design/Engr. | | – | – | 3 | 12 | 36 | 60 | 19 |
| Programming | | – | – | 7 | 2 | 7 | – | 5 |
| Management | | – | – | 3 | 4 | 3 | 20 | 3 |
| Other | | – | – | -- | 2 | 1 | – | 2 |
| | | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

Referring to the doctorate recipients' dissertations, 43% of the full-time employed graduates identified themselves as experimentalists and 31% as theoreticians; the remaining 26% noted both experimental and theoretical work. The upper portion of **Table VII** presents the distribution of employers for those two groups. Although the group of theoreticians is smaller, the percentage distributions are surprisingly similar; a slightly higher proportion of the theoreticians accepted government positions. The lower portion of **Table VII** is based on all the full-time employed doctorate recipients, and relates their employers to their work activities. The distribution of the latter is in close agreement with that measured by the Graduate Student Survey six months earlier.

In summary this follow-up survey reports on an improved employment picture when compared with that evaluated in the summer of 1976. The percentage-changes of those seeking employment and still uncommitted, are from 10% to 2% for PhD-level graduates, from 24% to 8% for new masters and from 22% to 8% for new bachelors. On the other hand the two groups of non-doctoral graduates have, to a great extent, settled for work that is unrelated to physics. Of those already employed in the summer of 1976, 12% of the masters and 19% or the bachelors described their work as making no use of their physics training. In the follow-up survey 21% of the masters and 45% of the bachelors described their employment as "unrelated to physics".

At the doctoral level, employment that is "unrelated to physics" takes on a different meaning and **Table VI** analyzed these findings. In the Graduate Student Survey of 1976, which this survey followed-up, all but 2% of the doctorate recipients described their new employment as "utilizing one's physics training".